



**Field Sampling Plan Addendum**

**Remedial Investigation/Feasibility Study**

**Falcon Refinery Superfund Site**  
**Ingleside, San Patricio County, Texas**  
**EPA Identification No. TXD086278058**

**Remedial Action Contract 2 Full Service**  
**Contract: EP-W-06-004**  
**Task Order: 0088-RICO-06MC**

*Prepared for*

U.S. Environmental Protection Agency  
Region 6  
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August 2013  
Revision: 00  
EA Project No. 14342.88

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12 August 2013

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Tim Startz, PMP  
EA Program Manager

Date



12 August 2013

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David S. Santoro, P.E., L.S.  
EA Quality Assurance Officer

Date

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Brian Mueller  
U.S. Environmental Protection Agency Region 6 Task Order Monitor

Date

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## LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
AVS/SEM	Acid Volatile Sulfides/Simultaneously Extracted Metals
COPC	Contaminant of potential concern
CSM	Conceptual Site Model
EA	EA Engineering, Science, and Technology, Inc.
EPA	U.S. Environmental Protection Agency
ERA	Ecological risk assessment
FS	Feasibility Study
FSP	Field Sampling Plan
HHRA	Human health risk assessment
NRDA	Natural Resource Damage Assessment
PCB	Polychlorinated biphenyl
RAC	Remedial Action Contract
RI	Remedial Investigation
site	Falcon Refinery Superfund Site
SVOC	Semi-volatile organic compound
TGLO	Texas General Land Office
TPWD	Texas Parks and Wildlife Department
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile organic compound



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## **1. PROJECT DESCRIPTION AND OBJECTIVES**

EA Engineering, Science, and Technology, Inc. (EA) has been authorized by the U.S. Environmental Protection Agency (EPA), under Remedial Action Contract (RAC) Number EP-W-06-004, Task Order 0088-RICO-06MC, to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Falcon Refinery Superfund Site (site). EA has prepared this Field Sampling Plan (FSP) Addendum to address the changes to the original FSP submitted to the EPA on 4 February 2012. These changes have been made in accordance with specification provided in the Field Change Form No. 01 and the Technical Exchange Meeting held on 2 May 2013. Appendix A of the FSP has not changed. The sampling design matrix for investigative samples in Appendix B of the FSP has been updated and is included in this FSP Addendum. All the figures in the FSP have been updated and are included in this FSP Addendum. The sections of the original FSP that have changed are discussed below. The section numbers correspond to the section numbers in the original FSP.

### **1.3 PROJECT OBJECTIVES**

The key components for the RI/FS have been changed as noted below:

- **Soil Sampling**
  - Onsite and offsite surface and subsurface soil sampling (up to 195 samples) will be collected from surface soil and from subsurface soil from borings installed to approximate depths to 15 feet below ground surface to assess presence of contaminants of potential concern (COPCs) of high toxicity and/or high mobility, define the nature and extent, characterize waste to allow for a disposal option evaluation in the FS, evaluate whether COPCs are migrating offsite, and develop data to be used in the Ecological Risk Assessment (ERA) and Human Health Risk Assessment (HHRA).
  - Surface and subsurface soil samples will be analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. Soil samples will also be analyzed for total organic carbon.
  - Two surface soil samples in Area of Concern (AOC) 3 will be analyzed for tributyltin compounds.
  - Background soil samples will only be analyzed for metals.
  - Soil samples taken above and below the water table from monitoring well borings will be also be analyzed for particle size, fraction of organic carbon, moisture content, specific gravity, wet sieve, and/or Atterberg limits.

- **Ground Water Sampling**

- Onsite (up to 17 samples) and offsite (up to 10 samples) ground water samples will be collected from permanent and temporary monitoring wells to determine the nature and extent of ground water COPCs. Permanent and temporary monitor well data will be used in the HHRA and ERA. Data collected during the onsite ground water investigation will also be used to update the pathway and receptor analysis presented in the conceptual site model (CSM), if necessary.
- Onsite ground water samples will be analyzed for VOCs, SVOCs, and total and dissolved metals.
- Offsite (background) ground water samples will only be analyzed for metals. Filtered samples will be collected for metals analyses, in addition to unfiltered ones.

- **Surface Water and Sediment Sampling**

- Onsite wetlands, intracoastal, and offsite background surface water (up to 33 samples) and sediment (up to 30 samples) investigations will be performed to define the nature and extent of COPCs, provide data to be used in the HHRA and ERA, and to update the pathway and receptor analysis presented in the CSMs, if necessary.
- Onsite sediment and surface water samples will be analyzed for VOCs, SVOCs, and total and dissolved metals.
- Surface water samples will also be analyzed for total suspended solids. Sediment samples will also be analyzed for acid volatile sulfides/simultaneously extracted metals (AVS/SEM).
- Offsite sediment and surface water samples will be analyzed for SVOCs and metals. Filtered samples will be collected for metals analyses, in addition to unfiltered ones for surface water.

- **Ecological Characterization**

- An ecological characterization may be conducted if the previous ecological characterization is not of the quality needed for this RI/FS.
- Up to 16 fish tissue samples will be collected and analyzed based on the results of the Screening Level Ecological Risk Assessment. Samples will be analyzed for parameters as directed by EPA, but will likely include lipids, metals, and SVOCs.

## 2. METHODOLOGY

### 2.1 SAMPLE COLLECTION

#### 2.1.1 Sediment Sampling for AVS/SEM

Sampling for AVS/SEM analysis for sediment samples will require minimal disturbance of the sediment. The sediment samples collected for this analysis should not be homogenized. The undisturbed sediment should be placed in the sample container leaving minimum headspace.

### 2.3 SAMPLE CONTAINER, VOLUME, PRESERVATION, AND HOLDING TIME REQUIREMENTS

Samples are not being analyzed for polychlorinated biphenyl (PCB), PCB congeners, and herbicides and pesticides. Therefore, Table 4 of the original FSP has been modified as follows.

**TABLE 4 REQUIRED VOLUME, CONTAINERS, PRESERVATIVES, AND HOLDING TIMES**

Parameter	Method	Volume and Container	Preservatives	Holding Time <sup>a</sup>
<b>Investigative Solid Samples</b>				
Metals (including mercury)	CLP ISM01.3	One 8-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap	Store at 4±2°C	180 days (28 days for mercury)
VOCs	CLP SOM01.2	Three 5-gram EnCore samplers and One 4-ounce glass jar with Teflon <sup>TM</sup> -lined cap	Store at 4±2°C	48 hours
SVOCs	CLP SOM01.2	One 8-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap	Store at 4±2°C	14 days
AVS/SEM	EPA-121-R91-100	One 4-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap	Store at 4±2°C	14 days
Tributyltin Compounds	GC-FPD	One 4-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap	Store at 4±2°C	14 days
TOC	EPA Method 9060	One 8-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap	Store at 4±2°C	28 days
Lipids (Fish Tissue)	Modified Bligh Dyer Method or an approved laboratory standard operating procedure.	One 4-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap	Store at 4±2°C	14 days
SVOCs (Fish Tissue)	SW-846 Method 8270C	One 4-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap	Store at 4±2°C	14 days
Metals (Fish Tissue)	SW-846 Method 6020 and 7471 (Mercury)	One 4-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap	Store at 4±2°C	180 days (28 days for mercury)
Moisture Content, Bulk Density, Particle	ASTM D2216, ASTM D7263, ASTM D422, ASTM D854/C127,	3-inch diameter Shelby Tube, at least 18 inches long, capped and taped with no headspace.	None	None

Parameter	Method	Volume and Container	Preservatives	Holding Time <sup>a</sup>
Size (wet), Specific Gravity, Atterberg Limits	ASTM D4318			
Fraction Organic Carbon	Walkley-Black	One 8-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap	Store at 4±2°C	28 days
<b>Investigative Water Samples</b>				
Metals (including mercury)	CLP ISM01.3	One 1-liter HDPE bottle	Nitric acid to Ph ≤ 2; Store at 4±2°C	180 days (28 days for mercury)
VOCs	CLP SOM01.2	Three 40-milliliter amber volatile organic analyte (VOA) glass vials with Teflon <sup>TM</sup> -lined cap	Hydrochloric acid to Ph≤2; Store at 4±2°C	14 days
SVOCs	CLP SOM01.2	Two 1-liter amber glass bottles	Store at 4±2°C	7 days
TSS	SM 2540 D	One 1-liter HDPE bottle	Store at 4±2°C	7 days
<b>Investigative Soil Vapor Samples</b>				
VOCs	EPA Method TO-15	6-liter Summa canister	None	28 days
<b>IDW Special Analysis</b>				
Reactivity Corrosivity Ignitability	SW-846 Method 9045C or 9040B, Method 1030, and Chapter 7	One 8-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap (solid) or one 500-milliliter HDPE bottle (water/sludge)	Store at ≤6°C	NA/72 hours
TCLP metals (including mercury)	SW-846 Methods 1311/6020/6010B/747 0A	One 8-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap (solid) or one 1-liter glass bottle (water/sludge)	Store at ≤6°C	180 days (28 days for mercury)
TCLP VOCs	SW-846 Methods 1311/8260B	One 4-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap (solid) or Three 40-milliliter amber VOA glass vials with Teflon <sup>TM</sup> -lined cap (water/sludge)	Store at 4±2°C	14 days
TCLP SVOCs	SW-846 Methods 1311//8270C	One 8-ounce amber glass jar with Teflon <sup>TM</sup> -lined cap (solid) or one 1-liter glass bottle (water)	Store at 4±2°C	14 days
<p>NOTE:</p> <p>a Holding time is measured from the time of sample collection to the time of sample extraction and/or analysis.</p> <p>ASTM = American Society for Testing and Materials</p> <p>°C = degrees Celsius</p> <p>CLP = Contract Laboratory Program</p> <p>GC-FPD = Gas Chromatography – Flame Photometric Detector</p> <p>HDPE = high-density polyethylene</p> <p>NA = Not applicable</p> <p>SVOC = Semi-volatile organic compound</p> <p>TAL = Target Analyte List</p> <p>TBD = To be determined</p> <p>TCLP = Toxicity Characteristic Leaching Procedure</p> <p>TOC = Total organic carbon</p> <p>TSS = Total suspended solids</p> <p>VOA = Volatile organic analyte</p> <p>VOC = Volatile organic compound</p>				

### **3. FIELD IMPLEMENTATION**

#### **3.1 AOC-1**

Figure 2 identifies the updated soil and ground water sample locations for AOC-1. The sample design matrix in Appendix B has been updated to identify the number of samples that will be taken and the analyses that will be performed.

#### **3.2 AOC-2**

Figure 3 identifies the updated soil and ground water sample locations for AOC-2. The sample design matrix in Appendix B has been updated to identify the number of samples that will be taken and the analyses that will be performed.

#### **3.3 AOC-3**

Figure 4 identifies the updated soil and surface water sample locations for AOC-3. Sediment samples will not be taken in AOC-3. The sample design matrix in Appendix B has been updated to identify the number of samples that will be taken and the analyses that will be performed.

#### **3.4 AOC-4**

Figure 5 identifies the updated soil and ground water sample locations for AOC-4. The sample design matrix in Appendix B has been updated to identify the number of samples that will be taken and the analyses that will be performed.

#### **3.5 AOC-5**

Figure 6 identifies the updated sediment and surface water sample locations for AOC-5. The sample design matrix in Appendix B has been updated to identify the number of samples that will be taken and the analyses that will be performed.

Fish samples will be collected from the intracoastal waterway if specified for sampling and analysis. Whole fish and fish fillet samples will be collected and prepared for laboratory analysis submittal. Fish tissue will be analyzed for lipids, SVOCs, and metals.

#### **3.6 AOC-6**

Figure 7 identifies the updated soil sample locations for AOC-6. The sample design matrix in Appendix B has been updated to identify the number of samples that will be taken and the analyses that will be performed.

### **3.7 AOC-7**

Figure 8 identifies the updated soil sample locations for AOC-7. The sample design matrix in Appendix B has been updated to identify the number of samples that will be taken and the analyses that will be performed.

### **3.8 BACKGROUND LOCATIONS**

Figure 9 identifies the updated background soil, sediment, surface water, and ground water sample locations. The sample design matrix in Appendix B has been updated to identify the number of samples that will be taken and the analyses that will be performed.



## **FIGURES**





N

0 250 500  
Feet

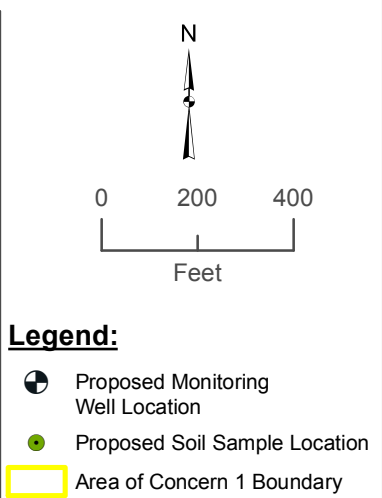
**Legend:**

- Area of Concern Boundary
- Active NORCO Pipeline**
  - Above ground
  - Underground
- Abandoned NORCO Pipeline**
  - Above ground
  - Underground
- Outside Operations**
  - Gulf South Pipeline
  - Boss Pipeline
  - Gathering Line 2'
  - Plains Marketing Pipeline

Source: AOC and pipeline locations from TRC, dated, March 10, 2011

Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009

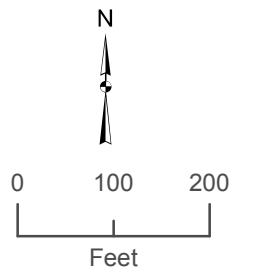




Source: AOC and pipeline locations from TRC, dated, March 10, 2011

Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009





- Legend:**
- Proposed Monitoring Well Location
  - Proposed Soil Sample Location
  - Area of Concern 2 Boundary

Note:  
Soil boring co-located with MW-11

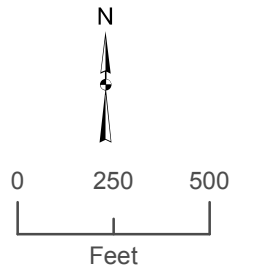
Source: AOC and pipeline locations from TRC, dated, March 10, 2011  
Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRS, 2009



Falcon Refinery Superfund Site  
Ingleside, San Patricio County, Texas

**Figure 3**  
**AOC-2 Sample Locations**  
**Field Sampling Plan**





- Legend:**
- Proposed Monitoring Well Location
  - Proposed Soil Sample Location
  - Proposed Surface Water Sample Location
  - Area of Concern 3 Boundary

Note:  
VSP - Visual Sample Plan

Source: AOC and pipeline locations from TRC, dated, March 10, 2011

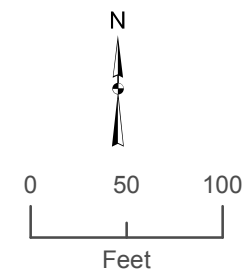
Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009






Falcon Refinery Superfund Site  
Ingleside, San Patricio County, Texas

**Figure 4**  
**AOC-3 Sample Locations**  
**Field Sampling Plan**





**Legend:**

-  Proposed Monitoring Well Location
-  Proposed Soil Sample Location
-  Area of Concern 4 Boundary

**Note:**  
VSP - Visual Sample Plan

Source: AOC and pipeline locations from TRC, dated, March 10, 2011

Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009



Falcon Refinery Superfund Site  
Ingleside, San Patricio County, Texas

**Figure 5**  
**AOC-4 Sample Locations**  
**Field Sampling Plan**





**Legend:**

- Proposed Sediment/Surface Water Sample Location
- Area of Concern 5 Boundary

Source: AOC and pipeline locations from TRC, dated, March 10, 2011

Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009



Falcon Refinery Superfund Site  
Ingleside, San Patricio County, Texas

**Figure 6**  
**AOC-5 Sample Locations**  
**Field Sampling Plan**





**Legend:**

- Proposed Soil Sample Location
- Area of Concern 6 Boundary

Source: AOC and pipeline locations from TRC, dated, March 10, 2011

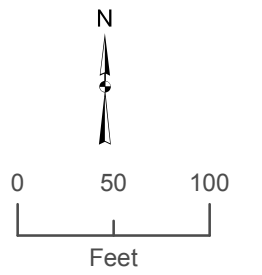
Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009



Falcon Refinery Superfund Site  
Ingleside, San Patricio County, Texas

**Figure 7**  
AOC-6 Sample Locations  
Field Sampling Plan





- Legend:**
- Proposed Soil Sample Location
  - Area of Concern 7 Boundary

Source: AOC and pipeline locations from TRC, dated, March 10, 2011  
 Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009



Falcon Refinery Superfund Site  
 Ingleside, San Patricio County, Texas

**Figure 8**  
 AOC-7 Sample Locations  
 Field Sampling Plan





N

0 750 1,500

Feet

**Legend:**

- Proposed Soil Sample Location
- Proposed Temporary Well at Soil Sample Location
- Proposed Sediment/Surface Water Sample Location
- Areas of Concern Boundary

Source: AOC and pipeline locations from TRC, dated, March 10, 2011

Image Source: 2009 Texas Orthoimagery Program, Texas Strategic Mapping Program, TNRIS, 2009



Falcon Refinery Superfund Site  
Ingleside, San Patricio County, Texas

**Figure 9**  
**Background Sample Locations**  
**Field Sampling Plan**



## **Appendix B**

### **Sample Design Matrix**

## Appendix B

SAMPLING DESIGN MATRIX  
FALCON REFINERY SUPERFUND SITE  
INGLESIDE, TEXAS

SAMPLING AREA	SAMPLE METHOD	Judgmental or Random	SAMPLE INTERVAL (feet bgs)	FIELD SCREENING	SAMPLE COLLECTION DESCRIPTION/FREQUENCY	ANALYSES															
						TCL VOC	TCL SVOC	TAL METALS	Dissolved Metals	AVS/SEM	TOC	TSS	Tributyltin	Permeability Sampling*	Lipids	PCBs	PCBs Congeners	Herbicides and Pesticides			
SOIL SAMPLES - SURFACE AND SUBSURFACE																					
DIRECT PUSH BORINGS																					
AOC-1N	Direct Push - Continuous Sampling with Acetate Liner	Judgmental	0 to 0.5	Continuous screening with FID/PID at 2-foot intervals from surface to total depth	VOCs - collect grab sample from 0 to 0.5 feet and 0.5 to 2 feet. From 2 feet to top of water table collect sample from interval with highest PID measurement. For all other analysis homogenize sample interval and collect sample.	8	8	8	0	0	8	0	0	0	0	0	0	0			
			0.5 to 2			8	8	8	0	0	8	0	0	0	0	0	0	0			
			2 to top of water table			8	8	8	0	0	8	0	0	0	0	0	0	0	0		
AOC-1S		Judgmental	0 to 0.5			12	12	12	0	0	12	0	0	0	0	0	0	0	0		
			0.5 to 2			12	12	12	0	0	12	0	0	0	0	0	0	0			
			2 to top of water table			12	12	12	0	0	12	0	0	0	0	0	0	0			
AOC-2		Judgmental	0 to 0.5			6	6	6	0	0	6	0	0	0	0	0	0	0	0		
			0.5 to 2			6	6	6	0	0	6	0	0	0	0	0	0	0			
			2 to top of water table			6	6	6	0	0	6	0	0	0	0	0	0	0			
AOC-3		Random	0 to 0.5			3	3	3	0	0	3	0	0	0	0	0	0	0	0		
			0.5 to 2			3	3	3	0	0	3	0	0	0	0	0	0	0			
			2 to top of water table			3	3	3	0	0	3	0	0	0	0	0	0	0			
AOC-4		Judgmental	0 to 0.5			5	5	5	0	0	5	0	0	0	0	0	0	0	0		
			0.5 to 2			5	5	5	0	0	5	0	0	0	0	0	0	0			
			2 to top of water table			5	5	5	0	0	5	0	0	0	0	0	0	0			
AOC-6		Judgmental	0 to 0.5			2	2	2	0	0	2	0	0	0	0	0	0	0	0		
			0.5 to 2			2	2	2	0	0	2	0	0	0	0	0	0	0			
			2 to top of water table			2	2	2	0	0	2	0	0	0	0	0	0	0			
AOC-7		Judgmental	0 to 0.5			2	2	2	0	0	2	0	0	0	0	0	0	0	0		
			0.5 to 2			2	2	2	0	0	2	0	0	0	0	0	0	0			
			2 to top of water table			2	2	2	0	0	2	0	0	0	0	0	0	0			
Background		Judgmental	0 to 0.5			0	0	10	0	0	0	0	0	0	0	0	0	0	0		
			0.5 to 2			0	0	10	0	0	0	0	0	0	0	0	0	0			
			2 to top of water table			0	0	10	0	0	0	0	0	0	0	0	0	0			
TOTAL DIRECT PUSH BORING SOIL SAMPLES						114	114	144	0	0	114	0	0	0	0	0	0				
MONITORING WELL BORINGS																					
AOC-1N	Hollow Stem Auger Continuous sampling with split spoon or continuous sampling device	Judgmental	0 to 0.5	Continuous screening with FID/PID at 2-foot intervals from surface to total depth	VOCs - collect grab sample from 0 to 0.5 feet and 0.5 to 2 feet. From 2 feet to top of water table collect sample from interval with highest PID measurement. For all other analysis homogenize sample interval and collect sample.	5	5	5	0	0	5	0	0	0	0	0	0	0			
			0.5 to 2			5	5	5	0	0	5	0	0	0	0	0	0	0			
			2 to top of water table			5	5	5	0	0	5	0	0	5	5	0	0	0			
			Below Water Table			0	0	0	0	0	0	0	0	5	5	0	0	0			
AOC-1S		Judgmental	0 to 0.5			7	7	7	0	0	7	0	0	0	0	0	0	0	0		
			0.5 to 2			7	7	7	0	0	7	0	0	0	0	0	0	0			
			2 to top of water table			7	7	7	0	0	7	0	0	7	7	0	0	0			
			Below Water Table			0	0	0	0	0	0	0	0	7	7	0	0	0			
AOC-2		Judgmental	0 to 0.5			1	1	1	0	0	1	0	0	0	0	0	0	0	0		
			0.5 to 2			1	1	1	0	0	1	0	0	0	0	0	0	0			
			2 to top of water table			1	1	1	0	0	1	0	0	1	1	0	0	0			
			Below Water Table			0	0	0	0	0	0	0	0	1	1	0	0	0			
AOC-3		Judgmental	0 to 0.5			3	3	3	0	0	3	0	2	0	0	0	0	0	0		
			0.5 to 2			3	3	3	0	0	3	0	0	0	0	0	0	0			
			2 to top of water table			3	3	3	0	0	3	0	0	3	3	0	0	0			
			Below Water Table			0	0	0	0	0	0	0	0	3	3	0	0	0			
AOC-4		Judgmental	0 to 0.5			1	1	1	0	0	1	0	0	0	0	0	0	0	0		
			0.5 to 2			1	1	1	0	0	1	0	0	0	0	0	0	0			
			2 to top of water table			1	1	1	0	0	1	0	0	1	1	0	0	0			
			Below Water Table			0	0	0	0	0	0	0	0	1	1	0	0	0			
TOTAL MONITORING WELL BORING SOIL SAMPLES						51	51	51	0	0	51	0	2	34	34	0	0	0			
TOTAL SURFACE AND SUBSURFACE SOIL SAMPLES						165	165	195	0	0	165	0	2	34	34	0	0	0			

SAMPLING DESIGN MATRIX  
FALCON REFINERY SUPERFUND SITE  
INGLESIDE, TEXAS

ANALYSES																				
SAMPLING AREA	SAMPLE METHOD	Judgmental or Random	SAMPLE INTERVAL (feet bgs)	FIELD SCREENING	SAMPLE COLLECTION DESCRIPTION/ FREQUENCY	TCL VOC	TCL SVOC	TAL METALS	Dissolved Metals	AVS/SEM	TOC	TSS	Tributyltin	Permeability Sampling*	Lipids	PCBs	PCBs Congeners	Herbicides and Pesticides		
QC FOR SURFACE AND SUBSURFACE SOIL SAMPLES																				
QC MS/MSD* (1/20 organics)	Various	Various	Not Applicable	As stated above for each designated sample location	11	11	N/A	0	0	N/A	0	N/A	N/A	N/A	0	0	0	0		
QC MS/MD* (1/20 inorganics)	Various	Various			N/A	N/A	11	0	0	N/A	0	N/A	N/A	N/A	0	0	0	0		
QC field duplicate (1/10)	Various	Various			20	20	20	0	0	20	0	1	N/A	N/A	0	0	0	0		
QC trip blank (water sample)	N/A	N/A			14	N/A	N/A	0	0	N/A	0	N/A	N/A	N/A	0	0	0	0		
QC Equipment Rinsate (water sample)	N/A	N/A			1 per day per nondedicated equipment	N/A	10	10	0	0	N/A	0	N/A	N/A	N/A	0	0	0	0	
TOTAL QC						31	31	31	0	0	20	0	1	0	0	0	0	0		
TOTAL SOIL SAMPLES INCLUDING QC - SOLID SAMPLES						196	196	226	0	0	185	0	3	34	34	0	0	0		
TOTAL WATER QC SAMPLES ASSOCIATE WITH SOIL SAMPLES						14	10	10	0	0	0	0	0	0	0	0	0	0		
SEDIMENT SAMPLES																				
AOC-3	Ponar/Sediment Coring Device	Judgmental	0 to 0.5	Not Applicable	Grab Samples	0	0	0	0	0	0	0	0	0	0	0	0	0		
AOC-5	Ponar/Sediment Coring Device	Judgmental	0 to 0.5			10	10	10	0	10	10	0	0	0	0	0	0	0	0	
Background	Ponar/Sediment Coring Device	Judgmental	0 to 0.5			0	20	20	0	0	0	0	0	0	0	0	0	0	0	
TOTAL SEDIMENT SAMPLES						10	30	30	0	10	10	0	0	0	0	0	0	0		
QC FOR SEDIMENT SAMPLES																				
QC MS/MSD* (1/20 organics)	Various	Various	Not Applicable	As stated above for each designated sample location	2	2	N/A	0	0	N/A	0	0	N/A	N/A	0	0	0	0		
QC MS/MD* (1/20 inorganics)	Various	Various			N/A	N/A	2	0	1	N/A	0	N/A	N/A	N/A	0	0	0	0		
QC field duplicate (1/10)	Various	Various			3	3	3	0	1	3	0	0	N/A	N/A	0	0	0	0		
QC trip blank (water sample)	N/A	N/A			5	N/A	N/A	0	N/A	N/A	0	N/A	N/A	N/A	0	0	0	0		
QC equipment rinsate (water sample)	N/A	N/A			1 per day per nondedicated equipment	N/A	5	5	0	N/A	N/A	0	N/A	N/A	N/A	0	0	0	0	
TOTAL QC						5	5	5	0	2	3	0	0	0	0	0	0	0		
TOTAL SEDIMENT SAMPLES INCLUDING QC - SOLID SAMPLES						15	35	35	0	12	13	0	0	0	0	0	0	0		
TOTAL WATER SAMPLES ASSOCIATED WITH SEDIMENT SAMPLES						5	5	5	0	0	0	0	0	0	0	0	0	0		
SURFACE WATER SAMPLES																				
AOC-3	Disposable Dipper	Random	Not Applicable	pH, specific conductance, temperature, TDS, ORP, and turbidity	Grab Samples	3	3	3	3	0	0	3	0	0	0	0	0	0		
		Judgmental	Not Applicable			0	0	0	0	0	0	0	0	0	0	0	0	0	0	
AOC-5		Judgmental	Not Applicable			10	10	10	10	0	0	10	0	0	0	0	0	0	0	0
Background		Judgmental	Not Applicable			0	20	20	20	0	0	0	0	0	0	0	0	0	0	0
TOTAL SURFACE WATER SAMPLES						13	33	33	33	0	0	13	0	0	0	0	0	0		
QC FOR SURFACE WATER SAMPLES																				
QC MS/MSD* (1/20 organics)	Various	Various	Not Applicable	As stated above for each designated sample location	2	2	N/A	0	0	N/A	0	N/A	N/A	0	0	0	0	0		
QC MS/MD* (1/20 inorganics)	Various	Various			N/A	N/A	2	2	0	0	N/A	N/A	N/A	N/A	0	0	0	0		
QC field duplicate (1/10)	Various	Various			4	4	4	4	0	0	4	0	N/A	N/A	0	0	0	0		
QC trip blank	N/A	N/A			3	N/A	N/A	N/A	0	0	N/A	N/A	N/A	N/A	0	0	0	0		
QC equipment rinsate	N/A	N/A			1 per day per nondedicated equipment	N/A	N/A	N/A	N/A	0	0	N/A	N/A	N/A	N/A	0	0	0	0	
TOTAL QC						9	6	6	6	0	0	4	0	0	0	0	0	0		
TOTAL SURFACE WATER SAMPLES INCLUDING QC						22	39	39	39	0	0	17	0	0	0	0	0	0		
GROUND WATER SAMPLES																				
AOC-1N	Low Flow Sampling	Judgmental	Not Applicable	Not Applicable	Grab Sample	5	5	5	5	0	0	0	0	0	0	0	0	0		
AOC-1S						7	7	7	7	0	0	0	0	0	0	0	0	0	0	0
AOC-2						1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
AOC-3						3	3	3	3	0	0	0	0	0	0	0	0	0	0	0
AOC-4						1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Background						0	0	10	10	0	0	0	0	0	0	0	0	0		
TOTAL GROUND WATER SAMPLES						17	17	27	27	0	0	0	0	0	0	0	0	0		
QC FOR GROUND WATER SAMPLES																				
QC MS/MSD* (1/20 organics)	Various	Various	Not Applicable	As stated above for each designated sample location	2	2	N/A	N/A	0	0	0	0	N/A	N/A	0	0	0	0		
QC MS/MD* (1/20 inorganics)	Various	Various			N/A	N/A	2	2	0	0	0	N/A	N/A	N/A	0	0	0	0		
QC field duplicate (1/10)	Various	Various			3	3	3	3	0	0	0	0	N/A	N/A	0	0	0	0		
QC trip blank	N/A	N/A			3	N/A	N/A	N/A	0	0	0	N/A	N/A	N/A	0	0	0	0		
QC equipment rinsate	N/A	N/A			1 per day per nondedicated equipment	N/A	5	5	5	5	0	0	0	N/A	N/A	N/A	0	0	0	
TOTAL QD						8	10	10	10	0	0	0	0	0	0	0	0	0		
TOTAL GROUND WATER SAMPLES INCLUDING QC						25	27	37	37	0	0	0	0	0	0	0	0	0		

SAMPLING DESIGN MATRIX  
FALCON REFINERY SUPERFUND SITE  
INGLESIDE, TEXAS

SAMPLING AREA	SAMPLE METHOD	Judgmental or Random	SAMPLE INTERVAL (feet bgs)	FIELD SCREENING	SAMPLE COLLECTION DESCRIPTION/ FREQUENCY	TCL VOC	TCL SVOC	TAL METALS	Dissolved Metals	AVS/SEM	TOC	TSS	ANALYSES						
													Tributyltin	Permeability Sampling*	Lipids	PCBs	PCBs Congeners	Herbicides and Pesticides	
SOIL VAPOR SAMPLES																			
AOC-1N	Low Flow Sampling	Judgmental	Not Applicable	Not Applicable	Grab Sample	5	0	0	0	0	0	0	0	0	0	0	0	0	
AOC-1S						7	0	0	0	0	0	0	0	0	0	0	0	0	0
AOC-2						1	0	0	0	0	0	0	0	0	0	0	0	0	0
AOC-3						3	0	0	0	0	0	0	0	0	0	0	0	0	0
AOC-4						1	0	0	0	0	0	0	0	0	0	0	0	0	0
Background						10	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL SOIL VAPOR SAMPLES						27	0	0	0	0	0	0	0	0	0	0	0	0	
QC FOR SOIL VAPOR SAMPLES																			
QC MS/MSD* (1/20 organics)	Various	Various	Not Applicable	As stated above for each designated sample location	2	N/A	N/A	N/A	N/A	0	0	0	0	N/A	N/A	0	0	0	
QC MS/MD* (1/20 inorganics)	Various	Various			N/A	N/A	N/A	N/A	N/A	0	0	0	N/A	N/A	N/A	0	0	0	
QC field duplicate (1/10)	Various	Various			3	N/A	N/A	N/A	N/A	0	0	0	0	N/A	N/A	0	0	0	
QC trip blank	N/A	N/A			N/A	N/A	N/A	N/A	N/A	0	0	0	N/A	N/A	N/A	0	0	0	
QC equipment rinsate	N/A	N/A			1 per day per nondedicated equipment	N/A	N/A	N/A	N/A	N/A	0	0	0	N/A	N/A	N/A	0	0	0
TOTAL QD						5	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL SOIL VAPOR SAMPLES INCLUDING QC						32	0	0	0	0	0	0	0	0	0	0	0	0	
FISH TISSUE																			
Intracoastal Waterway	Fillet or Whole	N/A	N/A	Not Applicable	Not Applicable	0	16	16	0	0	0	0	0	0	16	0	0	0	
TOTAL FISH TISSUE SAMPLES						0	16	16	0	0	0	0	0	0	16	0	0	0	
QC FOR FISH TISSUE SAMPLES																			
QC MS/MSD* (1/20 organics)	Various	Various	Not Applicable	As stated above for each designated sample location	N/A	1	N/A	N/A	N/A	0	0	0	0	N/A	N/A	0	0	0	
QC MS/MD* (1/20 inorganics)	Various	Various			N/A	N/A	1	N/A	N/A	N/A	0	0	0	N/A	N/A	N/A	0	0	0
QC field duplicate (1/10)	Various	Various			N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	0	N/A	N/A	N/A	0	0
QC trip blank	N/A	N/A			N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	N/A	N/A	N/A	0	0	0
QC equipment rinsate	N/A	N/A			1 per day per nondedicated equipment	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	N/A	N/A	N/A	0	0
TOTAL QD						0	1	1	0	0	0	0	0	0	0	0	0	0	
TOTAL FISH TISSUE SAMPLES INCLUDING QC						0	17	17	0	0	0	0	0	0	16	0	0	0	
* Permeability sampling includes analysis for particle size, fraction organic carbon, moisture content, specific gravity, wet sieve, and/or Atterberg limits.																			
AOC	Area of Concern					PID	Photo-ionization Detector												
AVS/SEM	acid volatile sulfides/simultaneously extracted metals					PCB	Polychlorinated Biphenyls												
bgs	below ground surface					QC	Quality Control												
FID	Flame Ionization Detector					SVOC	Semi-volatile Organic Compound												
MD	Matrix Duplicate					TAL	Target Analyte List												
MS	Matrix Spike					TCL	Target Compound List												
MSD	Matrix Spike Duplicate					TOC	Total Organic Carbon												
N/A/	Not Applicable					TSS	Total Suspended Solid												
						VOC	Volatile Organic Compound												